

TITLE OF THE INVENTION

DTMF LOCKOUT UTILITY USING EPOCH TIME STAMP

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BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to the field of telecommunications. More particularly, the present invention relates to determining customer data availability by calculating elapsed time.

Background Information

[0002] Some advanced intelligent network (AIN) telecommunications services provide a customer with an ability to change customer data, such as a personal identification number (PIN), a telephone number screening list, service options, etc. Typically, in order to make these changes, the customer calls a particular telephone number to connect to an interactive voice response (IVR) that acts as an interface to an element of the telecommunications network, such as a service control point (SCP). The IVR interface is designed to handle multiple and simultaneous calls. The IVR plays pre-recorded announcements and instructs the caller to choose among various options via the touch tone pad. Reacting to the input of the caller, the IVR stores the requested changes in a subscriber's call processing record (CPR) or database table that resides on the SCP. These changes take effect immediately and are available for immediate use by AIN service logic.

[0003] For example, a subscriber to an Outgoing Call Control (OCC) service, an AIN service, dials a ten digit OCC update number. A voice tells him to enter the phone number and pin number of the phone that is equipped with the OCC service. After entering the phone number and correct pin, the voice asks the caller to choose among a number of options. As an example, the voice might ask him to enter the number two on the touch tone pad to change the PIN. After entering the two, the customer is instructed to choose a

new PIN. Immediately after successfully entering the new PIN and confirmation of the desired change, the new PIN becomes the active PIN.

[0004] A problem with this method of customer change involves multiple users updating the same subscriber data. Whenever more than one person has the capability to change a particular subscriber's data, it is always possible that two or more authorized persons might try to initiate changes at the same time. An instance of this might be when two members of a household attempt to add non-restricted exception numbers to the Outgoing Call Control database. Simultaneous changes could have negative results on the subscriber's database. For this reason, a method is needed for "locking out" all but the first of the callers. By locking the subscriber's database during a (dual tone multi-frequency) DTMF update, subsequent callers are prevented from entering conflicting data until the first caller has finished.

[0005] A system must also allow for users that abandon the call after their database becomes tagged as "in use". The tag must be removed after the successful DTMF update and a timer must be used to allow the logic to know that the "in use" tag is no longer valid. Typically, the system sets a duration or time limit to ignore the "in use" switch if the date and time of the last update has passed.

[0006] In the current system, a Call Processing Record (CPR) that resides on a service control point (SCP) includes logic that examines the values of an "in use" flag, along with the time and date that flag was last updated and a number of time-out minutes, to determine whether a CPR is in use. If the "in use" flag is set to yes and the timer has not expired, callers will not be allowed to access the data until the current caller has finished updating or the timer expires. If the number of time-out minutes has expired since the flag was last updated, then: the flag is cleared (in use=No); the time and date are reset to the current time and date; and the return value indicates that the service logic should proceed as if the in use flag had not been set.

[0007] Currently, logic determines if the time out duration has expired by: comparing the current Gregorian date with the last update Gregorian date and subtracting the current time from the (last update time + the maximum lockout period). Problems arise if DTMF updates are made and the lockout period falls into the next day, i.e., just before midnight. When this happens special logic determines if the call should be locked from DTMF update. Furthermore, daylight savings time is not accounted for by the current method.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present invention is further described in the detailed description that follows, by reference to the noted drawings by way of non-limiting examples of embodiments of the present invention, in which like reference numerals represent similar parts throughout several views of the drawings, and in which:

Fig. 1 is a flow diagram showing an exemplary flow for determining whether data is available, according to an aspect of the present invention; and

Fig. 2 is a flow diagram showing an exemplary flow for calculating a number of elapsed seconds, according to an aspect of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0009] The present invention solves the problem of simultaneous DTMF updates to the same set of subscriber data. Also, the present invention compensates for Daylight Savings Time and is, therefore, reliable during those two periods in which the time is adjusted by one hour each year. This invention addresses and eliminates the problems caused by Daylight Savings time when calculating elapsed time between DTMF updates.

[0010] In view of the above, the present invention through one or more of its various aspects and/or embodiments is presented to accomplish one or more objectives and advantages, such as those noted below.

[0011] According to an aspect of the present invention, a method is provided for converting a current time and a Gregorian date, including a current year, a current month, and a current day, into an epoch time stamp. The method includes receiving the current time and the Gregorian date, and determining a number of seconds that have elapsed since a predetermined date up until, but not including, the current year. The method also determines whether the current year is a leap year, and determines a number of seconds that have elapsed since the beginning of the current year up until, but not including, the current month, based on whether the current year is a leap year. The method further calculates a number of seconds that have elapsed since the beginning of the current month up until, but not including, the current day, and calculates a number of seconds that have elapsed during the current day.

[0012] The determined number of seconds since the predetermined date, the determined number of seconds since the beginning of the current year, the calculated number of seconds since the beginning of the current month, and the calculated number of seconds during the current day are summed to obtain a converted time. Finally, it is determined whether Daylight Savings Time is in effect. When Daylight Savings Time is not in effect, 3600 seconds are added to the converted time. Thus, the converted time is the epoch time stamp indicating the number of elapsed seconds since the predetermined time.

[0013] In one embodiment, the determining a number of seconds that have elapsed since a predetermined date up until, but not including, the current year further comprises looking up the number of seconds in a table. In another embodiment, the determining whether the current year is a leap year requires comparing the current year with a table of leap years. In another embodiment, the determining a number of seconds that have elapsed since the beginning of the current year requires looking up the number of seconds

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in a table, which may include a column for leap year values, and a column for non-leap year values.

[0014] Determining whether Daylight Savings Time is in effect may include storing a current system time; changing a current system time zone to a current system time zone without Daylight Savings Time; obtaining a new system time using the current time zone without Daylight Savings Time; and comparing the new system time with the stored system time. When the new time differs from the stored time, it is determined that Daylight Savings Time is in effect.

[0015] In another aspect of the present invention, a method is provided for determining customer data availability. The method includes receiving a time stamp of a most recent update. The time stamp is a number of elapsed seconds since a predetermined date and a predetermined time. The method also includes determining whether the customer data is in use, and receiving a maximum duration of a lockout period. The maximum duration of the lockout period, the time stamp, and whether the customer data is in use are analyzed to determine whether the customer data is available.

[0016] The analyzing may include determining whether the sum of the time stamp and the maximum duration of the lockout period is greater than a current time. In this case, when the sum is greater than the current time, the customer data is not available. When the sum is less than or equal to the current time, the customer data is available. If the customer data is available, time stamp is replaced with a current time stamp and the customer data is indicated to be in use.

[0017] According to an embodiment of the present invention, a new custom node determines whether or not a CPR is in use. The new decision node provides for a cleaner and more understandable interface for the service logic designer. It also accounts for Daylight Savings Time. This node is inserted at the appropriate place in the service logic for the DTMF update CPR.

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[0018] Referring to Figure 1, at step 1 parameters are received. The parameters include a time stamp of the last DTMF update. The time stamp is the number of seconds since an arbitrary date, e.g., 1/1/70 00:00 GMT, as discussed in more detail below. Another parameter is an In Use Y/N call variable. Y means that the customer's data is in the process of being updated. The parameters also include a maximum duration of a lockout period in minutes.

[0019] After the parameters are received and the service logic is invoked, the logic analyzes the time stamp of the customer's last update, along with the In Use switch and maximum lockout duration time to determine whether or not to allow customer change. For example, the logic may determine if both the time stamp and lockout duration are valid. As shown at step 2, the logic determines if the In Use flag is set to "Y". If the In Use flag does not equal Y, at step 5 the customer will be allowed to proceed with updating, the time stamp is replaced with the current time stamp, the in-use flag is set to "Y" and then the logic ends. If the In Use variable is set to Y, at step 4 it is determined if the time stamp + the lockout duration is less than or greater than the current time.

[0020] If the time stamp + the lockout duration is greater than the current time, the DTMF process will not be allowed to occur, and at step 3 an announcement can be played to the caller asking him to try back at a later time. If the time stamp + the lockout duration is less than the current time, the DTMF process will be allowed to occur, the time stamp is replaced with the current time stamp, and the In Use flag is set to "Y" at step 5. Subsequently, the logic ends, and if the caller has not prematurely abandoned the call, the In Use flag is set to "N".

[0021] The present invention is intended to make the process of determining customer data availability simpler and more reliable for the service developer. One advantage is to ensure that customers are allowed to change their AIN service data in a safe and reliable fashion.

[0022] In order for this new user interface and method of calculating elapsed time to be compatible with older time stamps, another aspect of the present invention converts a Gregorian date and time into a time stamp representing the number of seconds elapsed since an arbitrary time and date.

[0023] Referring to Figure 2, an explanation of exemplary logic will now be described.

[0024] Initially, at step 10 the Gregorian date to be converted is received. An exemplary format includes a two digit month, a two digit day, and a four digit year, i.e., MM/DD/YYYY. The time to be converted is also received at step 10. An exemplary format is two digits for hours and two digits for minutes, i.e., HH:MM.

[0025] Next, at step 12 the number of seconds that have elapsed up to but not including the current year is determined. In one embodiment, the number of seconds is retrieved from a table. An exemplary table is shown as Table 1.

YEAR	SECONDS
1970	0
1971	31536000
1972	63072000
1973	94694400
1974	126230400
1975	157766400
1976	189302400
1977	220924800
...	...

TABLE 1

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[0026] At step 14, it is determined if the current year is a leap year. In one embodiment, a table that contains all leap years from 1970 to 2030, i.e., 1972, 1976, 1980, 1984....., is searched.

[0027] At step 16, the number of seconds that have elapsed in the current year, up to but not including the current month is determined, based on whether the current year is a leap year. In one embodiment, the number of seconds is retrieved from a table having several columns, including one column for non leap years and another column for leap years. An exemplary table is shown as Table 2. The column SECONDS is for non leap years and the column LSECONDS is for leap years. Subsequently, the retrieved number of seconds is added to the total number of elapsed seconds up to the current year.

MONTH	SECONDS	LSECONDS
1	0	0
2	2678400	2678400
3	5097600	5184000
4	7776000	7862400
5	10368000	10454400
etc.

TABLE 2

[0028] At step 18, the number of seconds up to but not including the current day of the month is calculated. The calculation multiplies the date by $24 * 60 * 60$. Subsequently the calculated value is added to the number already stored.

[0029] At step 20, the current time is used to calculate the elapsed seconds for the converted day. The calculation multiplies the hour by 3600 and the minutes by 60. Those numbers are added to the number already stored.

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[0030] At step 22 it is determined whether or not Daylight Savings time is in effect. More specifically, the current time is stored and then the system time is changed to the current time zone not observing Daylight Savings Time. For example, Central Daylight Savings Time would become Central Standard Time. In another example, Central Standard Time would remain Central Standard Time. The new time (after changing the system time) is then compared with the stored time to see whether they are the same. If not, Daylight Savings Time is in effect.

[0031] If Daylight Savings Time is not in effect, at step 24 3600 seconds are added to the final number to obtain the exact number of elapsed seconds since the predetermined time. Otherwise, the sum of the seconds is the exact number of elapsed seconds since the predetermined time.

[0032] It is understood that the words that have been used are words of description and illustration, rather than words of limitation. Changes may be made within the purview of the appended claims, as presently stated and as amended, without departing from the scope and spirit of the invention in its aspects. Although the invention has been described with reference to particular means, materials and embodiments, the invention is not intended to be limited to the particulars disclosed; rather, the invention extends to all functionally equivalent structures, methods, and uses such as are within the scope of the appended claims.

[0033] In accordance with various embodiments of the present invention, the methods described herein are intended for operation as software programs running on a computer processor. Dedicated hardware implementations including, but not limited to, application specific integrated circuits, programmable logic arrays and other hardware devices can likewise be constructed to implement the methods described herein. Furthermore, alternative software implementations including, but not limited to, distributed processing

or component/object distributed processing, parallel processing, or virtual machine processing can also be constructed to implement the methods described herein.

[0034] It should also be noted that the software implementations of the present invention as described herein are optionally stored on a tangible storage medium, such as: a magnetic medium such as a disk or tape; a magneto-optical or optical medium such as a disk; or a solid state medium such as a memory card or other package that houses one or more read-only (non-volatile) memories, random access memories, or other re-writable (volatile) memories. A digital file attachment to email or other self-contained information archive or set of archives is considered a distribution medium equivalent to a tangible storage medium. Accordingly, the invention is considered to include a tangible storage medium or distribution medium, as listed herein and including art-recognized equivalents and successor media, in which the software implementations herein are stored.

[0035] Although the present specification describes components and functions implemented in the embodiments with reference to particular standards and protocols, the invention is not limited to such standards and protocols. Each of the standards for Internet and other packet-switched network transmission and public telephone networks represent examples of the state of the art. Such standards are periodically superseded by faster or more efficient equivalents having essentially the same functions. Accordingly, replacement standards and protocols having the same functions are considered equivalents.